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# Montana



Natural Resource  
Information System

## Montana

Water Information

Natural Heritage Information

Geographic Information



# Fiscal Year 1997 Annual Report

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# Fiscal Year 1997 Annual Report

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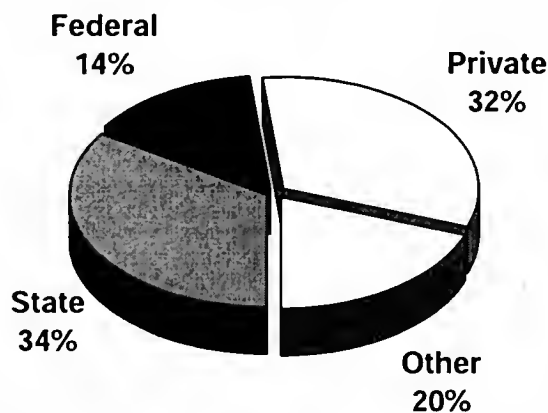
# Introduction

The Montana Natural Resource Information System (NRIS) was formed in response to the growing need for quick access to the increasing amounts of natural resource information.

As a program of the Montana State Library, NRIS makes information on Montana's natural resources easily and readily accessible. Serving government agencies, business and industry, and private citizens, NRIS operates a clearinghouse and referral service to link users with the best information. In 1985, NRIS began by providing services through its Montana Natural Resource Index and the Montana Natural Heritage Program. In response to growing user needs, the program expanded to include the Montana Water Information System and the NRIS Geographic Information System.

## NRIS Mission Statement

The Montana Natural Resource Information System provides comprehensive access to information about Montana's natural resources to all Montanans through the acquisition, storage, retrieval, and dissemination of that information in meaningful form.



NRIS Users by Sector for FY97

Over the years, NRIS strived to meet the growing information needs and challenges of Montana's governmental agencies, private business, and general public by developing new services. NRIS now offers a wide variety of data management, information indexing, and data retrieval services. Fiscal year 1997 was a busy time for NRIS.

We increased our information self-service capabilities as reflected in an average of 234 user sessions per day

on our Internet site while still providing over 2,500 mediated requests for natural resource information and services. The **Natural Heritage Program** responded to over 900; the **Water Information System** responded to over 450 requests; and the **Geographic Information System** responded to over 650 mediated requests. In addition, we assisted other agencies meet their information requests by assisting the Departments of Environmental Quality and Fish, Wildlife, and Parks to implement Internet Web sites. NRIS hosts their Internet sites and provides technical assistance in maintaining the sites.



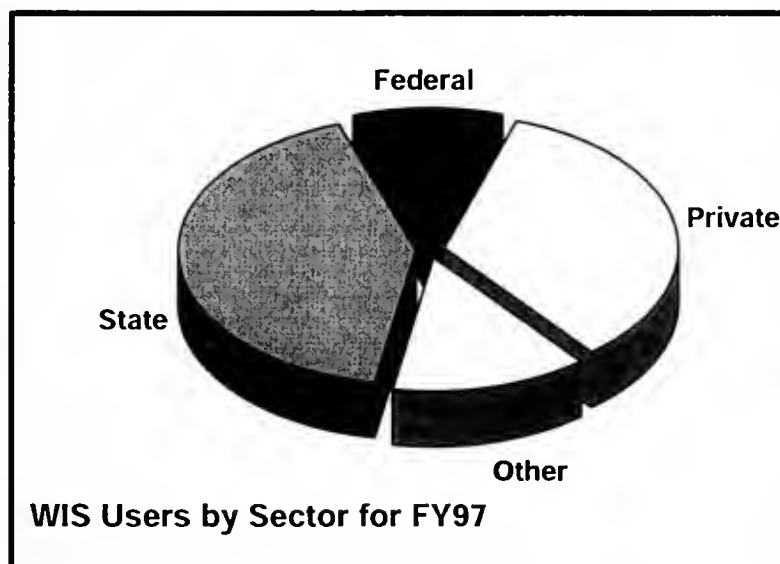


# FY97 Highlights

Detailed reports for each of the NRIS programs are contained in the following pages. This section provides a quick overview of some of the program activities during FY97.

## Water Information System

During 1997, staff continued increasing and refining Internet links to water information and data. Internet data sources continue to mature and provide more useful products and report formats. This makes the information easier to obtain for Water System staff as they serve the public, and for the public with direct Internet access to serve them selves.



Use of geographic information system (GIS) technology remains a high priority for the Water Information System, and plans were made to implement a simple web-based data base and GIS application on several water web pages. These applications will make it easier to identify pertinent data collection sites, view data tables, and download data and maps. The web-based applications will be launched during the next fiscal year.

Training of existing staff on the use of GIS technology also remains a high priority. Staff use GIS as a supplemental tool for finding data sites of interest to patrons and for filling information requests and delivering data. In addition, a GIS Programmer/Analyst position was added to the Water System during the reporting period. This position is used to increase the capability to work on water-related GIS projects requested by other state agencies. During the period, two new contracts were signed and four more will be ready for signing in the next fiscal year. The new position will also assist in the effort to help personnel from several other state agencies apply GIS as an effective desktop tool for a variety of water resource applications and data management projects.

Internet access continues to have a major positive impact on the Water Information System's data delivery and clearinghouse service. For the reporting period, the average number of users accessing the Water Page was between 140 and 170 each day. Monthly totals for Internet users ranged between 4000 and 5000. These users essentially "serve themselves" without interacting with staff. However, because the web pages organize data sources by data type and provide quick access to the data, they also make it easier for WIS staff to find information for patrons that do not have Internet access.





## Geographic Information System

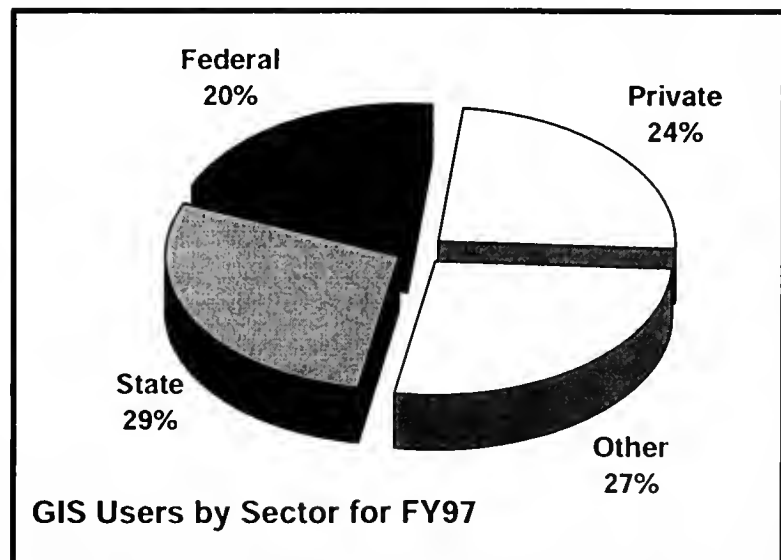
During FY97, the NRIS GIS program worked to enhance a diverse array of products and services provided to Montana's GIS community. Along with traditional mediated services where we assist GIS users on an individual basis we greatly expanded our educational outreach activities and our networked based services.

GIS is becoming a dominant information management technology in Montana. Currently federal, state, local government agencies, as well as schools and libraries are greatly expanding their use of GIS technology. As a result, there is a strong demand for both our information services and for technical support. We are responding to these demands by automating access to more of our data holdings and by increasing our abilities to provide training and user support.

We have provided multiple ways to access our database documentation files (metadata) on-line for several years. During FY97 we focused on putting the databases on-line. We went from having 14 on-line databases at the beginning of FY97 to 491 by the end of the year.

We also started implementing on-line access to geographic information in the form of on-line mapping applications. We began by working with the Environmental Systems Research Institute (ESRI) Map Objects Internet Map Server and have deployed one interactive mapping application that is accessible from our web site. We also participated in a beta-testing program for the ArcView Map Server program from ESRI and will be looking to deploy this technology during FY98. Allowing NRIS patrons to query geographic information via the Internet is a fundamental milestone in our services and will expand access to our data holdings to a much broader user base. We intend to significantly expand this component of our services during the upcoming year.

During FY97 we filled 655 total requests and developed 6590 products through our mediated services. We also provided hundreds of thousands of maps, documentation reports, and databases through the Internet to an additional 61,590 patrons. We intend to continue to enhance our Internet services during the upcoming year to provide our patrons with easy, efficient methods to identify and acquire the information they need.

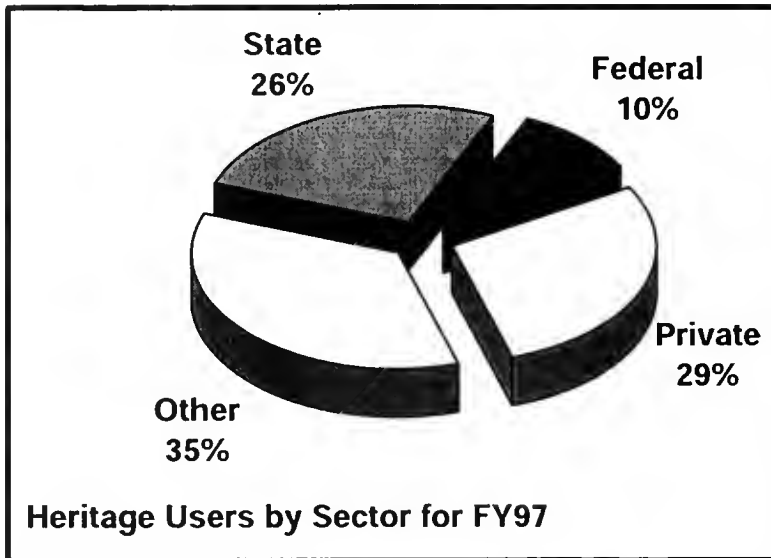


There was a drop in the total number of mediated requests filled from FY96. Three of the factors influencing this statistic are the increased ability of patrons to use our "self service" Internet resources, the winding down of the Clark Fork GIS System which included a large number of small mapping requests, and our work on several large projects that had a smaller number of

large tasks that are counted as a single request.

### Natural Heritage Program

Significant progress was made in 1997 towards easier and broader distribution of program information. In particular, valuable photographic information has been assembled by the program for over a decade; however, distribution of images has always been problematic. The



program acquired equipment in 1997 to allow for scanning, storing and distributing photo and illustration images via the Internet, and well as printing them in-house with a high-resolution color printer.

This capability now allows us to fully use and share these visual resources, which are a critical component in species and habitat identification.

Over 900 data requests were received and answered in FY 1997, from all sectors: state, federal, local government as well as the private

sector. In addition, over 600 requests were filled for the U.S. Forest Service staff in Region 1 via a subset of Heritage data available on their mainframe system. These figures do not include visits to our Internet site, which averages 50 user-sessions and 450 "hits" per day.



# NRIS On the Internet: <http://nriss.mt.gov>

During FY97 NRIS continued to expand our Internet presence. NRIS operates a File Transfer Protocol (FTP) server, electronic mail services for all of the NRIS staff and the State Library, a Telnet server that allows remote log in to the NRIS network, and our most visible service--our World Wide Web (WWW) site. The WWW site consists of a "Home Page" that describes the overall program and provides hyper-links to other pages that provide details on all of NRIS's services and as well as

access to natural resource data. The NRIS site is an on-line clearinghouse of natural resource information with connections to a myriad of other related sites around the nation. During FY97, there was an average of nearly 1,700 user sessions per week (an average of 234 user sessions per day) on the NRIS Web site. In addition, we added Web sites for the Montana Department of Fish, Wildlife, and Parks, the Montana Department of Environmental Quality, the Montana Department of Natural Resources and Conservation, and the Montana Historical Society. NRIS provided assistance in designing, training, and technical decision-making as the departments worked to develop and implement their sites. NRIS then provided the computer hardware and software to host the Web sites, perform backups, implement system security, and allow the department to have on-line access to maintain the information content of the sites. We feel that providing this service to these natural resource agencies helps us fulfill our mission as a natural resource information clearinghouse. The new Internet services NRIS and these agencies are providing are extending our services to all Montanans regardless of the time of day or where they may live.



## Water Information System Internet Highlights

During FY97 the Water Information staff directed a major effort to maximize the use of the Internet for retrieving and delivering water information. New web pages were added to the Water Information site and existing pages were re-designed to speed direct access to useful and important sources. Plans have been made to implement both web-based data base and GIS application during the next year. It appears that these applications will be completed and made available early in the next fiscal year.

Access to near real-time information on snow pack, reservoir storage, streamflow discharge and El Niño and La Niña indices are a few of the data types available from the Water Information

Web Pages. All of this information is available in ready-to-use graphic and map format. The map products make it possible to quickly assess moisture conditions on a statewide and regional basis. The Drought Monitoring page was re-designed to provide access to more drought/water supply information on a state, national, and global scale. During the period from February to August, Drought Monitoring products are updated monthly and widely used. The maps and graphics can be downloaded and used for a variety of purposes. In addition, maps from the Montana Rivers Information System for each basin in Montana were made available for viewing and downloading from the WIS site. See figure on following page of the Upper Missouri Basin.

### **GIS Internet Highlights**

The NRIS GIS program has provided multiple ways to access our database documentation files (metadata) on-line for several years. During FY97 we focused on putting the databases on-line. We went from having 14 on-line databases at the beginning of FY97 to 491 by the end of the year. In addition, we enhanced our National Spatial Data Infrastructure (NSDI) node by upgrading from a WAIS server to an Isite server. The upgrade added more search capabilities and a friendlier user interface. (See figure on following page) Also, we assisted the University of Montana and Montana State University in implementing NSDI nodes. These three NSDI nodes made Montana the first state to have multiple NSDI nodes.

The GIS also started implementing on-line access to geographic information in the form of on-line mapping applications. We started by working with the Environmental Systems Research Institute (ESRI) Map Objects Internet Map Server<sup>TM</sup> and have deployed one interactive mapping application that is accessible from our web site. We also participated in a beta-testing program for the ArcView Map Server program from ESRI and will be looking to deploy this technology during FY98. Allowing NRIS patrons to query geographic information via the Internet is a fundamental milestone in our services and will expand access to our data holdings to a much broader user base. We will significantly expand this component of our services during the upcoming year.

### **Natural Heritage Program Internet Highlights**

In February the program hired Scott Lee-Chadde, who brings excellent skills in both ecology and computer programming. He is currently developing Internet access to large portions of Heritage Program data, with a variety of query and report options. In particular, the Program developed an interactive on-line guide to enable users to query information for species of special concern. (See figure on following page)

# Montana Geospatial Data Clearinghouse Spatial Data Search Engine

|  |   |
|--|---|
| <b>Choose Collections to Search:</b><br><br>You can select more than one database.<br>Windows users need to hold down the control key to select multiple collections.<br><div style="border: 1px solid black; padding: 2px;"><div style="background-color: black; color: white; padding: 2px;">Montana State Library</div><div>University of Montana</div><div>Montana State University</div><div>Montana Dept. of Environmental Quality</div></div> | <b>Add Spatial Search:</b><br><div style="text-align: center;"><input type="radio"/> Yes    <input checked="" type="radio"/> No</div> <div style="display: flex; justify-content: space-around; align-items: flex-start; padding: 10px;"><div style="text-align: center;"><i>West</i><br/><div style="border: 1px solid black; width: 80px; height: 30px; margin: 5px auto; text-align: center;">-116</div></div><div style="text-align: center;"><i>North</i><br/><div style="border: 1px solid black; width: 80px; height: 30px; margin: 5px auto; text-align: center;">49</div></div><div style="text-align: center;"><i>East</i><br/><div style="border: 1px solid black; width: 80px; height: 30px; margin: 5px auto; text-align: center;">-104</div></div></div> <div style="text-align: center; margin-top: 10px;"><i>South</i><br/><div style="border: 1px solid black; width: 80px; height: 30px; margin: 5px auto; text-align: center;">44.25</div></div> |
|--|---|

**Text Search:**

| Field    | Operator | Text Input   | And/Or  |
|----------|----------|--|---|
| FullText | contains | <div style="border: 1px solid black; width: 250px; height: 25px;"></div> | <div style="border: 1px solid black; width: 50px; height: 25px;"></div> |
| FullText | contains | <div style="border: 1px solid black; width: 250px; height: 25px;"></div> |   |

**Temporal Search:**    ☒ No Date Search

☐ Publication Date

☐ Publication Date

☐ Publication Date

Maximum Number of Responses to View: 

20

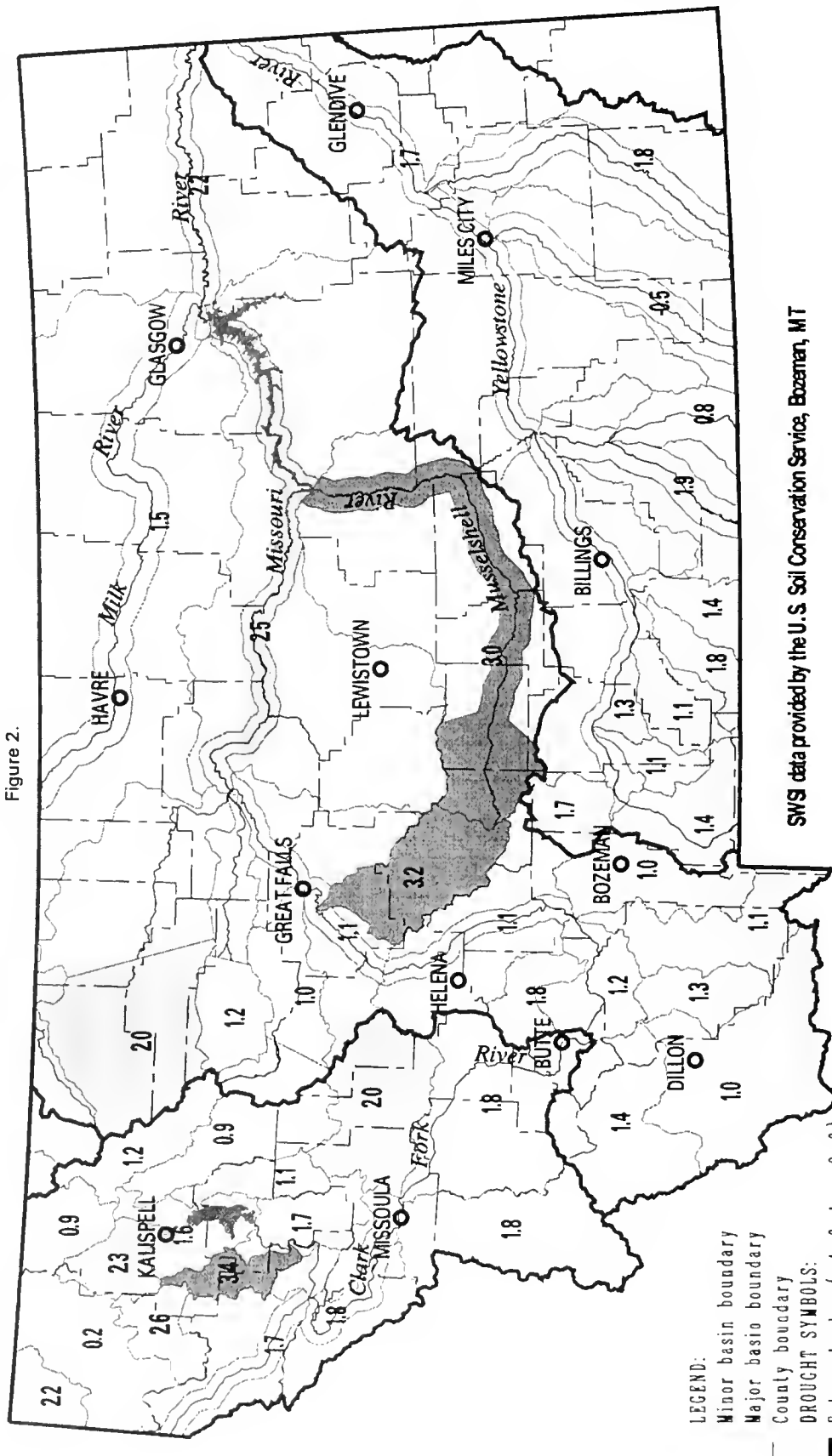
Submit Query

Reset

When you are done searching please **LOGOUT**

Logout

Figure 2.



SWSI data provided by the U.S. Soil Conservation Service, Bozeman, MT

## Surface Water Supply Index (SWSI) Values:

### July 1, 1997

NOTE: SWSI values primarily indicate water supply conditions for irrigated lands within each basin. The values shown may be based on provisional data and subject to change.

# Montana Species Query Form

If this is the first time you've used this form, please read the following tips and explanation.

## Guidebook Credits

1. **Search for** (select one or both):

☒ Plants

☐ Animals

2. **Search Criteria** (Select *only* a, b, or c)

a. **Species name:**

\_\_\_\_\_  
(Scientific or Common name)

b. **Counties in Montana:**

Beaverhead

Big Horn

Blaine

Broadwater

Carbon



(hold down **Ctrl** and click to select multiple counties)

**Status of the species:**

☐ Endangered Species Act

- and/or - ☐ US Forest Service

☐ Bureau of Land

Management

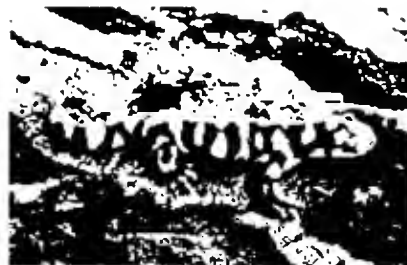
☐ MTNHP Status

c. **Guidebook Entries only:** ☐

Look It Up!

Reset Form

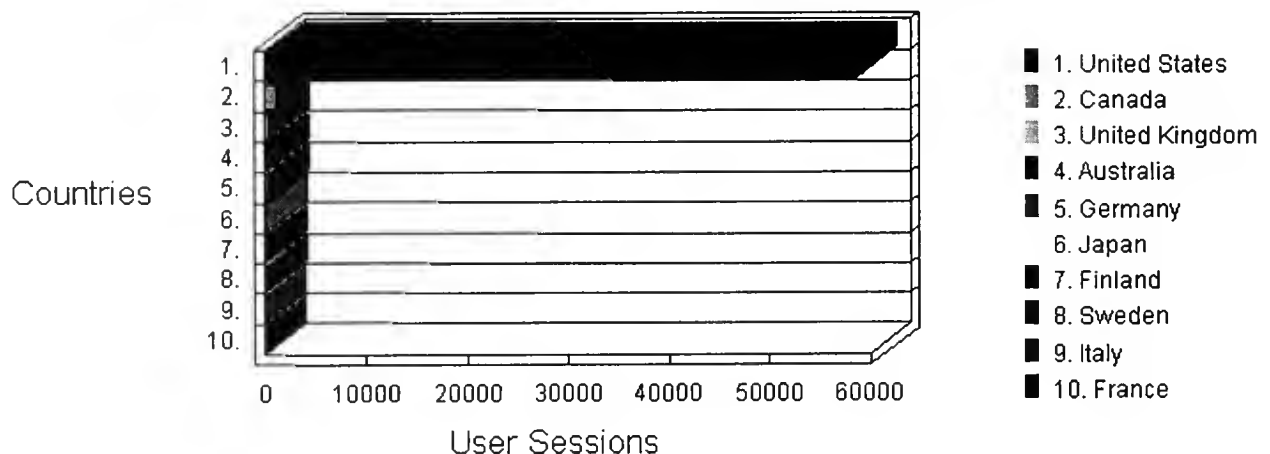
[Home](#) | [GIS](#) | [Heritage](#) | [Water](#) | [Nris Contacts](#)



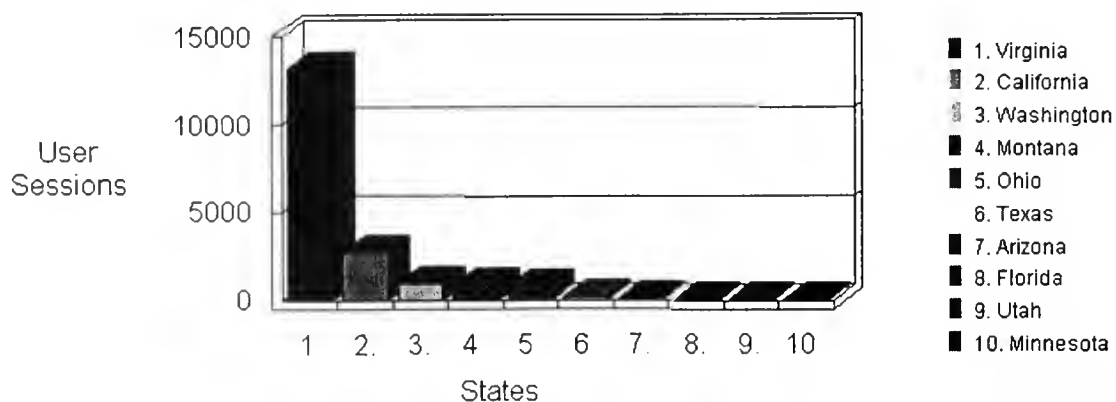
Below are some figures and charts that demonstrate the extent the NRIS WWW services are accessed.

| General Web Server Statistics         |                                       |
|---------------------------------------|---------------------------------------|
| Date & Time this report was generated | Friday September 12, 1997 - 13:47:48  |
| Timeframe                             | 07/01/96 00:00:00 - 07/01/97 00:00:00 |
| Number of Hits for home page          | 23505                                 |
| Total No. of Successful Hits          | 1269452                               |
| Total No. of User Sessions            | 85719                                 |
| User Sessions from (United States)    | 68.38%                                |
| International User Sessions           | 4.71%                                 |
| Origin Unknown User Sessions          | 26.9%                                 |
| Average Hits per Day                  | 3468                                  |
| Average User Sessions per Day         | 234                                   |
| Average User Session Length           | 00:07:04                              |

## Most Active Countries

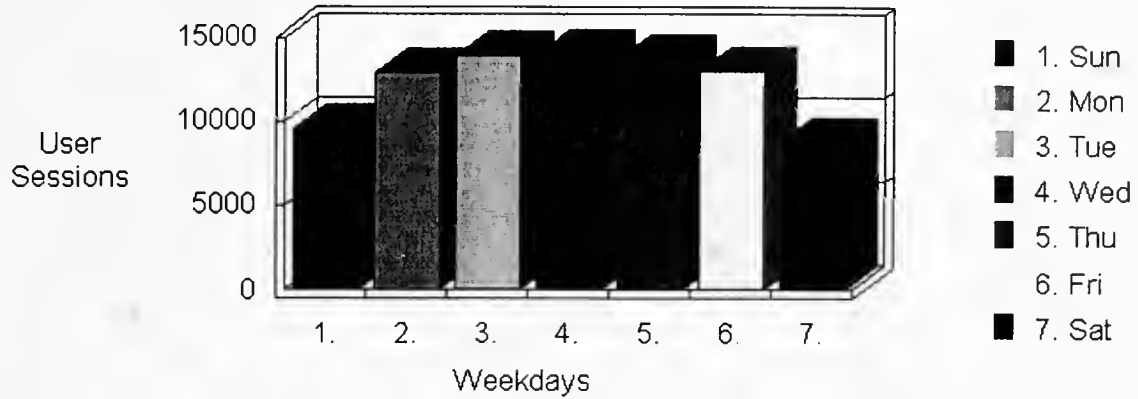


## North American States & Provinces

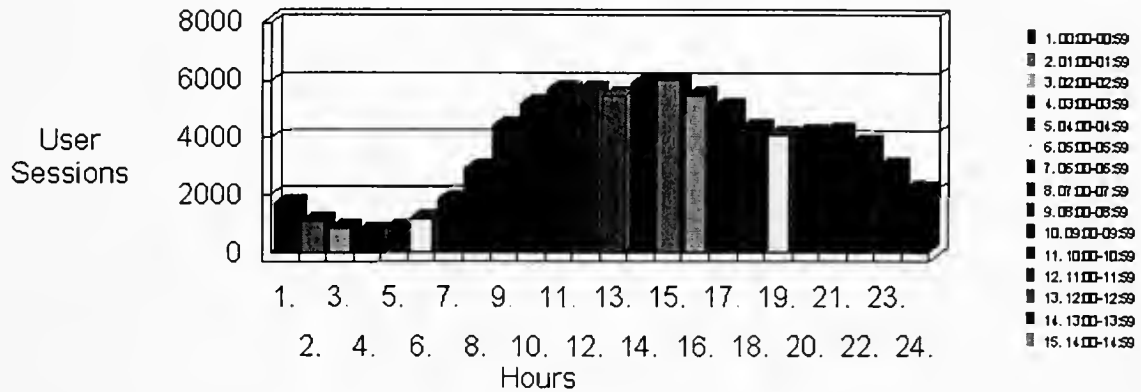




## Activity By Day of Week



## Activity By Hour of Day



# **Water Information System**

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## **Information Requests**

Internet access continues to have a major positive impact on the Water Information System's data delivery and clearinghouse service. For the reporting period, the average number of users accessing the Water Page was between 140 and 170 each day. Monthly totals for Internet users ranged between 4000 and 5000. These users essentially "serve themselves" without interacting with staff. However, because the web pages organize data sources by data type and provide quick access to the data, they also make it easier for Water System staff to find information for patrons that do not have Internet access.

A substantial portion of the workload at the Water Information System consists of providing custom responses to a information requests that cannot be filled through the web pages. Custom service is available for patrons that do not have access to the Internet, and for more complicated requests. The Water System will continue to place high priority on serving patrons that require custom service and assistance.

About 453 non-Internet requests were processed during 1997. This is lower than last year's number. Of the 453 non-Internet requests, approximately 40 percent came from state agencies, 30 percent were from the private sector, 20 percent were from the "other" category, primarily academic, local and county government. Federal agencies accounted for 10 percent of the requests. Among state agencies, DNRC and DEQ account for about 20 percent each of the requests. These agencies are followed by FWP, NRIS, and DOT.

Approximately 52,000 individuals visited the Water Internet pages during the reporting period. Most of the users appear to be from Montana and accessing the Water pages through independent Internet providers. Statistics by type of organization remained similar to last year and indicate that about 30 percent of the users are private individuals, 30 percent are from the education sector, and about 12 to 15 percent are associated with a federal, state, or local governmental agency. The Internet usage has greatly enhanced the Water Information System's ability to serve users.

### **Program Outreach**

A large part of this year's outreach effort was directed toward state natural resource agencies affected by the reorganization. Water Information staff met periodically with personnel from DEQ and DNRC throughout the year to provide input on sources of water data, upgrade options for porting data bases to more modern data base software, services available from the NRIS and Water Information, and potential applications for GIS. On one occasion, DEQ personnel approached the Water Information Coordinator and presented an opportunity to provide contracted services to create a water quality management application. However, the Coordinator knew that another section within the DEQ had already contracted for and received a data management software package that would serve the initial request. The Water Information Coordinator worked with both DEQ sections to make them aware of each other's efforts. This is a good example of how outreach efforts and contacts of the Water System can increase communication and coordination, and effectively reduce duplication of effort.

Water personnel also provided workshops, seminars, and presentations to other state agencies, the public, and educators during the reporting period. These presentations provided good opportunities to raise awareness of services provided by NRIS as a whole and the Water System in particular. Presentations were made to groups from the following: DEQ, DNRC, FWP, Department of Agriculture (D of A), and Disaster and Emergency Services (DES). Workshops and presentations were also provided to educators in the Kalispell area and at the Environmental Education Association annual meeting in Billings.

### **Water Related Coordination Committees**

Advising committees on water information policy continued to be an important activity for the period. Throughout the year the Water Information Coordinator provided updates to the following committees: Environmental Quality Council (EQC) which now includes the Legislative Water Policy Committee; Water Resources Coordination Committee; Watershed Advisory Committee; Wetlands Coordination Council, Drought Advisory Committee, and others. The Coordinator continues to chair the Ground Water Assessment Steering Committee. The committee-related work provides opportunity to track statewide operations of other state and federal agencies, and to keep apprised of existing laws and policies that effect water resources.

### **Internet Access**

As mentioned in previous reports, Water Information staff has directed a major effort to maximizing the use of the Internet for retrieving and delivering water information. New web pages were added to the Water Information site and existing pages were re-designed to speed direct access to useful and important sources. Plans have been made to implement both web-

based database and GIS applications during the next year. It appears that these applications will be completed and made available early in the next fiscal year.

Access to near real-time information on snow pack, reservoir storage, streamflow discharge and El Niño and La Niña indices are a few of the data types available from the Water Information Web Pages. All of this information is available in ready-to-use graphic and map format. The map products make it possible to quickly assess moisture conditions on a statewide and regional basis. The Drought Monitoring page was re-designed to provide access to more drought/water supply information on a state, national, and global scale. During the period from February to August, Drought Monitoring products are updated monthly and widely used. The maps and graphics can be downloaded and used for a variety of purposes.

## **Projects Overview**

**Montana Rivers Information System (MRIS):** MRIS data continues to be requested frequently. This year Water staff placed 99 high quality hydrologic unit maps on the MRIS web page. The maps show stream reaches with MRIS data and include the EPA River Reach Number (RRN). Users can view the maps using the Adobe Reader software, which can be obtained free of charge from the Adobe homepage. These maps and general information about MRIS is also accessed frequently from the MRIS Web page.

The MRIS database continues to be one of the primary sources of river-related information for Montana. Discussions with FWP MRIS personnel led to a renewed effort to make the MRIS available over the Internet. New contract tasks were drawn up to include the development of a simple web-based form that can interact with the MRIS data base to return an MRIS full report back to the users web page. Work on this effort will initiate at the beginning of the new fiscal year. This web-based MRIS application will replace the SUMMITNET access and will be expanded in future years to include a full suit of report formats. Planning is also proceeding to implement a web-based GIS application for accessing MRIS data.

**Montana Drought Monitoring:** As stated above, Drought Monitoring products continue to be valuable tools for a variety of users and are accessed frequently. Products provided during the reporting period included the SWSI maps, histograms, and special histograms comparing the current month's SWSI with the previous month's values. Steps to reopen the Climate Center at MSU were unsuccessful, as were efforts to secure funding production a new precipitation and soil index. The Water Information Coordinator with assistance from DNRC staff member Jesse Aber, continued to negotiate with Desert Research Institute (DRI) and the National Weather Service in Great Falls to increase drought information accessibility. Efforts to refine the Drought/Water Supply Monitoring program will continue to be a high priority in the coming fiscal year. The Water Information System remains committed to expanding the use of drought and climate information and will continue to use the Internet and the news media to keep citizens informed.

**Montana Ground Water Atlas:** The Atlas was completed during the reporting period and delivered to a publisher for final production of the publication. The Water Information

Coordinator is working with the publisher to over-come technical difficulties in transferring text, maps and graphics in electronic format. Several technical problems have been solved and it is anticipated that the printed version of the Atlas will be completed in the fall of 1997. An electronic version of the Atlas and maps will be "published" on a new ground-water web page being developed by the Water Information staff. The electronic version of the Atlas will be published in September or October of 1997. Both printed and electronic versions of the Atlas will be useful resources for water resource managers, educators, and private citizens.

**Volunteer Water Monitoring:** Work on this project was initiated during the reporting period.

An advisory committee was formed, mission statement, project goals, and specific work tasks were completed. A review of existing water monitoring software was started and background information was collected to support Water Information staff in developing web-based applications to support Volunteer Water Monitoring in Montana. In addition, the Water Information Coordinator provided presentations and briefings to Volunteer Water Monitoring staff, educators, and individual watershed committees on the availability of water quality data and information, water data management, and potential uses of GIS technology for volunteer groups.

**DEQ Waterbody - EPA RRN Project:** This project will be completed early in the next fiscal year, probably by August 1997. Products from this effort will include: 1) a GIS layer of hydrography with EPA River Reach Numbers (RRN) linked to the DEQ impaired streams data base; and 2) an ArcView user interface capable of querying and displaying streams and impaired data base records for the pilot project area (Upper Yellowstone drainage). During the next phase of the project, DEQ project staff will examine the finished coverage to complete a data quality check, something that was not possible prior to the coverage's existence. DEQ and Water Information personnel will make a series of presentations to DEQ administration to highlight the impaired stream GIS coverage and to outline possible future directions and enhancements to the database.

**DEQ Wetlands Metadata Project:** This project focuses on identifying PC software that can be used to help entities creating wetlands data bases and also create metadata for each data base. The list of tools was provided to the Wetlands Coordination Council and its data subcommittee. Demonstrations of several software packages were provided to the Council and examples of completed metadata records were also given. The final deliverable for this project is to provide technical assistance and advise to agencies interested creating metadata for wetlands information bases.

**DEQ Wetlands Data Clearinghouse Project:** A contract for this project was implemented at the start of the fiscal year. The goals of this project are: 1) provide clearinghouse services for any wetlands related information and data on the Internet; 2) provide some simple mapping support to identify gaps and coverage in wetlands data bases; and 3) assist the Wetlands Coordination Council in prioritizing areas where wetlands data is critical to address growth issues; and 4) assist the Council members in coordination of data collection and funding of the National Wetlands Inventory.

**DEQ Public Drinking Water Supply Project:** The Water Information Coordinator was asked by DEQ personnel for input and advice on obtaining more accurate locations for public drinking water supply wells. After an initial meeting, DEQ began efforts to develop a contract for Water Information services to: 1) conduct a pilot project for two counties to use address matching to generate point location information for public supply wells; 2) compare point locations generated from address matching with locations generated by global position system (GPS) technology; 3) if the results of step one are acceptable to the DEQ Public Drinking Water program staff, use the addressing technique for the other counties; 4) receive GPS locations for public supply wells from the Montana Bureau of Mines and Geology (MBMG) after MBMG personnel visit those wells; and 5) develop a simple ArcView user interface to allow DEQ staff to query and maintain the PDWS data base in a GIS format. The contract for this project is under development at end of the fiscal year.

**Upper Clark Fork Steering Committee Support Project:** Department of Natural Resource and Conservation (DNRC) personnel wrote a grant proposal to the US EPA to provide mapping and data support to the Upper Clark Fork Steering Committee. About 80 percent of the grant funding will be subcontracted to the Water Information System for Committee support. EPA awarded the grant to the DNRC and work was initiated but not completed by the end of the fiscal year to develop a contract with NRIS. Project work will include: 1) obtaining water data for the basin in GIS format from various sources; 2) creating map compositions displaying the information as specified by the Steering Committee to assist in water use planning efforts; 3) make it possible to view the data coverages with ArcView. Work on the project will start as soon as contract is completed.

**Watershed Coordination Council Support Project:** Department of Natural Resource and Conservation (DNRC) personnel asked the Water Information System to assist the council in developing a web page and a web-based watershed project tracking system. Project work will focus on creating a high-profile web page and using ArcView Map Server to display the state's hydrologic units. Users will be able to select a hydrologic unit and view a simple list of active projects and contacts.

The Montana Water Center at Montana State University (MSU) also contacted the Water Information System to offer funding support on the Watershed Council project. The Water Center was notified that they would receive a grant from the EPA to support watershed coordination in the state. Work by the DNRC and the Water Center to develop contracts with NRIS was initiated by not completed by the end of the fiscal year. Work on the project will start as soon as contract is completed.



# Geographic Information System

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During FY97, the NRIS GIS program worked to enhance a diverse array of products and services provided to Montana's GIS community. Along with traditional mediated services where we assist GIS users on an individual basis we greatly expanded our educational outreach activities and our networked based services.

GIS is becoming a dominant information management technology in Montana. Currently federal, state, local government agencies, as well as schools and libraries are greatly expanding their use of GIS technology. As a result, there is a strong demand for both our information services and for technical support. We are responding to these demands by automating access to more of our data holdings and by increasing our abilities to provide training and user support.

We have provided multiple ways to access our database documentation files (metadata) on-line for several years. During FY97 we focused on putting the databases on-line. We went from having 14 on-line databases at the beginning of FY97 to 491 by the end of the year.

We also started implementing on-line access to geographic information in the form of on-line mapping applications. We started by working with the Environmental Systems Research Institute (ESRI) Map Objects Internet Map Server and have deployed one interactive mapping application that is accessible from our web site. We also participated in a beta-testing program for the ArcView Map Server program from ESRI and will be looking to deploy this technology during FY98. Allowing NRIS patrons to query geographic information via the Internet is a fundamental milestone in our services and will expand access to our data holdings to a much broader user base. We intend to significantly expand this component of our services during the upcoming year.

During FY97 we filled 655 total requests and developed 6590 products through our mediated services. We also provided hundreds of thousands of maps, documentation reports, and databases through the Internet to an additional 61,590 patrons. We intend to continue to enhance our Internet services during the upcoming year to provide our patrons with easy, efficient methods to identify and acquire the information they need.

There was a drop in the total number of mediated requests filled from FY96. Three of the factors influencing this statistic are the increased ability of patrons to use our "self service" Internet resources, the winding down of the Clark Fork GIS System which included a large number of small mapping requests, and our work on several large projects that had a smaller number of large tasks that are counted as a single request.

The following tables summarize GIS products and services provided during the last two fiscal years.

### FY 1997 Mediated GIS Services

| Total Requests | Maps | Reports | Programs | Data | Other | Total Products |
|----------------|------|---------|----------|------|-------|----------------|
| 655            | 4033 | 68      | 49       | 2085 | 355   | 6590           |

### FY 1996 Mediated GIS Services Summary

| Total Requests | Maps | Reports | Programs | Data | Other | Total Products |
|----------------|------|---------|----------|------|-------|----------------|
| 897            | 5409 | 201     | 53       | 2449 | 229   | 8341           |

### Internet Services

Use of Internet services provided by NRIS GIS continued to grow steadily during FY97. Currently patrons who are on the Internet can access the GIS program to find general information or to access selected map graphics, documentation, and databases. These services have been implemented by installing a World Wide Web (WWW) server and "Home Page", an ISITE search engine, an "Anonymous FTP" site, and interactive mapping applications on the GIS computer network. Use of the Internet services has grown steadily since their inception. During FY97 61,590 users accessed NRIS GIS web services, this represents a 64% increase over 1996 when we had 39,316. Currently we are averaging 168 Internet users a day, seven days a week. During 1997 these users downloaded 29 gigabytes of GIS databases and several gigabytes of documentation, images, and other information.

Since we are investing so much of our efforts in Internet based services we feel it is vital to make efforts to insure our patrons can access those services. During FY97 we produced a workbook titled "Using the Internet to Find Spatial Data" that we have been using when conducting workshops on the Internet and GIS.

### Montana GIS Users' Group

NRIS GIS plays an active role in the Montana GIS Users' Group. The Users' Group is a non-profit consortium of government agencies and business involved with GIS technology. The main activities of the Users' Group are an annual conference and publication of the *Montana GIS News*, and GIS outreach efforts for K-12.

The annual Montana GIS Users' Group Conference provides an opportunity for individuals interested in GIS to share ideas and experiences. The 1997 Conference in Bozeman attracted over 400 participants. NRIS helped with the conference by providing administrative support, actively participating on planning committees, hosting workshops, and making presentations. NRIS also hosted a Public Night where members of the local community had an opportunity to learn about GIS.



The *Montana GIS News* is designed to facilitate the transfer of information about GIS data, activities, and projects in Montana. The newsletter is published by NRIS for the Montana GIS Users' Group.

The Users' Group awarded a \$1000 grant to Corvallis High School to develop a web site oriented to use of GIS in K-12 education.

A major effort undertaken by the Users' Group this year is the establishment of endowed scholarships at both major Montana Universities. The scholarships will assist students pursuing studies related to GIS. This year the Users' Group was successful in reaching its' goal of establishing a \$10,000 endowment at Montana State University. The endowments will fund a \$500 annual scholarship in perpetuity at each university. GIS staff member Kris Larson serves on the GIS Users' Group Board of Directors.

### **Montana Interagency GIS Technical Working Group**

The Montana Interagency GIS Technical Working Group (TWG) is a forum for the exchange of information regarding the acquisition of new GIS data, the existence of current GIS data, and the status of new and on going GIS projects. The TWG also promotes and develops standards and procedures related to GIS. NRIS supports the TWG by providing administrative support and by actively participating in meetings and sub-committees.

Major accomplishments of the User Group during FY97 included securing funds for the completion of the 1:24,000 Digital Elevation Models (DEMs) for Montana. The completion of the DEMs will be the first step in building a 1:24,000 database of basemap information for Montana.

### **GIS Seminars**

For the past six years, the NRIS GIS Program has offered a series of GIS Seminars. The seminars are held once a month throughout the fall, winter, and spring. A GIS expert typically gives an hour-long presentation to a wide variety of GIS users from governmental agencies and the private sector. The topics of the seminars range from software specific technical tips and tricks to general information about topics such as cartography or new GIS projects in the state. Seminar Topics for the 1996-97 season included:

Black-Footed Ferrets, Prairie Dogs, GPS & GIS; Randy Matchett, Wildlife Biologist; US Fish and Wildlife Service; Lewistown, MT; January 19, 1996

Mapping Existing Vegetation and Land Cover Across Large Geographic Areas Using Remote Sensing and a GIS, Roly Redmond; WSAL Lab; Missoula, MT; April 12, 1996

Placing Economic Data into a Geographic Context; Dr. Larry Swanson; Center for the Rocky Mountain West; Missoula, MT; May 17, 1996

Deriving and Using Products for NDVI for Fire Danger Rating; Robert E. Burgan; Research Forester; Intermountain Fire Sciences Lab; Missoula, MT; September 20,

1996

Using the Wildlife Spatial Analysis Lab's Vegetation and Landcover Data; Gerry Daumiller; Natural Resource Information System; Helena, MT; October 25, 1996

Hydrologic Mapping with GIS for the Montana Groundwater Characterization Program; Larry N. Smith; Montana Bureau of Mines and Geology; Butte, MT; January 31, 1997

The Montana Local Government GIS Coalition (MLGGC); Jackie Magnant; Montana State University; Bozeman, MT; February 28, 1997

Access! Importing and Exporting Data; John Hinshaw; The Natural Heritage Program; Helena, MT; March 28, 1997

Color Models - Defining and Using Colors with Arc/Info and the World Wide Web OR Why What You See is NOT What You Get; Gerry Daumiller; Natural Resource Information System; Helena, MT; April 18, 1997

Lewis and Clark County Automated Road and Addressing Project; Lee Shanklin; Lewis & Clark County; Helena, MT; May 23, 1997

## **GIS in Schools and Libraries**

The GIS in Schools and Libraries project is an effort to promote public access to GIS databases by enabling schools and libraries with the software, data, and expertise required to use GIS. The project was very active this year with 16 new schools coming on-line. Many new schools and libraries joined the program in 1997. The libraries and schools added are: Meagher County Library, Bozeman High School, Morningstar School Bozeman, Anderson School Bozeman, Monfortan School Bozeman, Longfellow School Bozeman, Billings Skyview, Riverside Middle School Billings, Belgrade High School, Corvallis High School, Westview Junior High School Hamilton, Hamilton High School, Harlowton High School, Helena Flats Kalispell, Helena High School, Kalispell Junior High School, Libby High School, Sidney Middle School, UM ITRC, Castle Rock Middle School Library - Billings

The Montana State Library is also one of the more than 100 participants nationwide in the Association of research Libraries "GIS in Libraries" project.

## **Projects Overview**

**Department of Environmental Quality CFGIS** - NRIS GIS has been responsible for the long term management and implementation of the Clark Fork GIS (CFGIS) in support of remediation efforts for the Clark Fork Superfund sites since 1988. This project supports the needs of a wide variety of groups including: Department of Environmental Quality (DEQ), U.S. Environmental Protection Agency, Atlantic Richfield Corporation, several local governments, and private citizens. The CFGIS is composed of hundreds of databases that must be managed to

efficiently support users on a variety of information systems. During FY97 2961 products in the form of maps, data, analysis, reports, or programs were delivered to system users.

**U.S. Forest Service** - NRIS provided programming, cartographic design, and database development support to the Forest Service in support of ecosystem management. Major database development efforts for this project include development of a 5<sup>th</sup> code watershed database, an Ecological Units database, and a Land Type Associations database. Analysis has included developing various models for mapping regions by geology, landform, topography, and stream character. Analysis included characterization by vegetation, parent material, topography, landuse, and demographics.

**Montana Department of Fish Wildlife and Parks** - NRIS provided the Kalispell office assistance in using GIS software and hardware during the period. NRIS also provided numerous maps and reports to various FWP staff for reports and public meetings during the period.

**DEQ - Air Quality Division** - NRIS GIS supported DEQ staff with mapping and analysis of project areas in Whitefish, Missoula, Billings, Kalispell, and East Helena. This project included incorporating data from diverse sources and designing and implementing GIS analysis to support the modeling of air quality in the affected communities.

**Northern Great Plains Steppe Ecosystem Assessment** - This project is in support of ecosystem assessment of Northern Great Plains under contract to the Nature Conservancy. Covering all or part of 5 US states and two Canadian provinces this project requires innovative data acquisition and management techniques. This ecosystem assessment has resulted in the largest merging of Natural Heritage System data sets in North America encompassing over 26,000 records on plant and animal species of special concern.

**Montana Natural Resource Data Clearinghouse** - This is our Internet based system to provide automated access to GIS databases and mapping. The system includes ISITE search engine, Federal Geographic Data Committee (FGDC) compliant metadata, and on-line GIS databases. This system received an "Excellent Systems in Government Award" from the Urban and Regional Information System Association in July of 1996.

**DEQ - Coal and Uranium Bureau** - During FY97 NRIS provided various services in support of the DEQ Coal and Uranium Bureau GIS. GIS staff continued to supply technical support to DEQ GIS staff as requested. NRIS also provided administrative support and paid for the DEQ UNIX and GIS software maintenance agreements.

**DEQ - Abandoned Mine Bureau** - NRIS GIS staff worked with DEQ staff to develop databases and maps to support remediation of coal mining areas in the Belt Sand Coulee area north of Great Falls. Products developed to date include basemap data layers, historic mining locations, and surficial geology data.

**Natural Resource Damage Claim** - NRIS GIS provided various GIS services under contract to the Natural Resource Damage Claim (NRDC) in the Montana Department of Justice during

FY97. Tasks completed included map design, database development, and analysis. NRIS also supplied NRDC contractors with various databases for their use.

**State Historic Preservation Office** - GIS staff worked with the State Historic Preservation Office (SHPO) to develop a database for a major project they have on the Flying D ranch in southwestern Montana. The project tasks completed this year included database development, map production, and analysis.

**Lewis and Clark County** - NRIS GIS staff provided technical support and programming services to the Lewis and Clark County GIS program in parcel mapping and road network development.

**Non-Point Source GIS** Under a grant from the U.S. EPA NRIS GIS has developed GIS databases and teaching materials for use in understanding non-point source pollution issues. NRIS staff has developed databases, a workbook, and conducted 7 workshops with Montana teachers, conservation groups, and libraries under this project.



# Natural Heritage Program

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Significant progress was made in 1997 towards easier and broader distribution of program information. In particular, valuable photographic information has been assembled by the program for over a decade; however, distribution of images has always been problematic. The program acquired equipment in 1997 to allow for scanning, storing and distributing photo and illustration images via the Internet, as well as printing them in-house with a high-resolution color printer. This capability now allows us to fully use and share these visual resources, which are a critical component in species and habitat identification.

## **Data Management:** *Acquisition, storage, manipulation, and retrieval of information for project planning and research*

Program scientists conducted numerous research projects in the course of 1997, with all results incorporated into the various data base systems managed by the program.

The most significant developments include:

- Refinement and population of a Point Observation Database. This work enables the program to collect species observation information from a variety of sources (e.g., museum specimens, sightings, photos) and process them quickly and efficiently into a data base linked to GIS. Currently the system contains over 20,000 records, and has resulted in products such as amphibian and reptile range maps published in *Montana Outdoors*, and comprehensive mammal and herpetile distribution information provided to the Montana Gap Analysis project.
- Development of a statewide flora. The program is currently collaborating with the U.S. Forest Service in crosswalking and standardizing a comprehensive flora for Montana, for which work will continue into 1998. Anticipated benefits of this project include: a utility for generating species lists; quick reference as to whether a species is native or exotic, county distribution, and National Wetland Indicator status.
- Internet access. In February the program hired Scott Lee-Chadde, who brings excellent skills in both ecology and computer programming. He is currently developing Internet access to large portions of Heritage Program data, with a variety of query and report options.

Over 900 data requests were received and answered in FY 1997, from all sectors: state, federal, local government as well as the private sector. In addition, over 600 requests were filled for the U.S. Forest Service staff in Region 1 via a subset of Heritage data available on their mainframe system. These figures do not include visits to our Internet site, which averages 50 user-sessions and 450 "hits" per day.

Virtually all requests continue to be accompanied by a GIS map showing general locations of species as part of the data response. We can easily search large areas of the state, stream or

highway corridors, or irregularly shaped project areas, providing users with a graphic projection of locations in addition to the detailed information in text form.

Database growth continued at a healthy pace. Range, technical description, diagnostic characteristics and habitat information was completed for approximately 130 plant species, and 500 additional literature sources were abstracted and entered. Approximately 10,000 records on species observations were assimilated into the Point Observation Database. Database maintenance includes deletions: approximately 200 location records were dropped from active tracking due to the fact certain species were more abundant than previously thought. Also, the program continued with a high update rate: approximately 20% of program records are modified in the course of a year as a result of new information, corrections, changes in taxonomy or status changes.

### **Zoology:** *Research, Monitoring, Inventory, and Technical Information Service on Animals*

The Heritage Program suffered a tremendous loss in 1997 with the untimely death of its lead zoologist, Jim Reichel. It is with great pride, respect and affection that we carry on the work that Jim initiated. Until a new zoologist is hired, Paul Hendricks, assistant zoologist, has assumed most of Jim's responsibilities.

Highlights of 1997 work include:

The program received a foundation grant from Canon to search for a presumed extinct mollusc, *Discus brunsoni*. Paul Hendricks has relocated the species in the Mission Mountains and will be compiling the results in a report. He hopes to publish his findings in 1998.

Extensive work on the harlequin duck continue in northwest Montana, resulting in a comprehensive literature review, and additional banding, surveys and monitoring work in the Kootenai and Flathead drainages. Two status reports have been completed summarizing the results.

A survey of over 300 lakes and reservoirs greater than 40 acres on the Lewistown District of BLM was completed for colonial nesting water and shorebirds. Several new Black Tern, Common Tern, Forster's Tern, and Black-crowned Night-Heron colonies were found, but fewer than had been expected. The report for this project is in preparation.

There continues to be high interest in bats; in particular, by resource managers making decisions about mine reclamation. Surveys were conducted in the Little Rocky Mountains, and at specific sites across the state related to mine closures. The program uses specialized detection equipment that records species' echolocation calls, in combination with mist-netting and visual surveys.

Amphibians and reptiles were surveyed in the Lewistown District of the BLM, and on US FWS refuges in eastern Montana. Results continue to indicate Leopard Frogs have undergone a dramatic decline in western Montana in the past 30 years and are currently declining in much of

eastern Montana as well. Western Toads also seem to be declining. Additional workshops were held on identification of Montana's reptiles and amphibians, due to the high level of enthusiasm for earlier workshops.

The zoology program continued its work with the Partners in Flight Steering Committee, the Harlequin Duck Working Group, the Montana Piping Plover Working Group, the Montana Bird Distribution Steering Committee, the Western States Bat Working Group, the Arctic Grayling Workgroup, the Baird's Sparrow Working Group, and the Montana Prairie Dog Working Group.

These efforts contribute to better coordination of research and management of these species as well as provide more effective means of agency collaboration and data sharing. The Heritage Program has played a key role in providing technical support and data management capabilities for many of these efforts.

The Montana Animal Species of Special Concern list was updated in February 1997. This list, and its companion list for plants, the most widely distributed publication of the program, with hundreds of copies mailed, downloaded or otherwise transmitted annually.

### **Botany: Research, Monitoring, Inventory, and Technical Information Service on Rare Plants**

The Montana Plant Species of Special Concern list update of 1997 has a sleek new look and is coupled with new search tools on the Internet. Work continues on developing a Montana Rare Plant Guide over the Internet - the work of obtaining or commissioning approximately 1200 photographs and illustrations, completing text, and editing is roughly half done overall. The images are being scanned in-house and documented in a new database.

Results from fifteen 1996 botany studies have been written up in reports, representing the 50/50-challenge cost-share support of several offices of three federal agencies. New information resulting from these studies has been incorporated into corresponding program databases. A second, short-term botanist was hired on short notice to help complete 1997 projects. Highlights of 1997 botany studies are presented below.

Status surveys will be completed for three "globally imperiled" species: Idaho sedge (*Carex parryana* ssp. *idahoensis*), taper-tip desert-parsley (*Lomatium attenuatum*), and Ute ladies'-tresses (*Spiranthes diluvialis*). The good news is that one of them is NOT globally imperiled, and that the other two are not as restricted as indicated by previous records.

Ongoing monitoring was conducted for three "globally imperiled" species: Lemhi penstemon (*Penstemon lemhiensis*), long-styled thistle (*Cirsium longistylum*), and Ute ladies'-tresses (*Spiranthes diluvialis*).

Several of the studies had a "marathon" aspect to them, including a water howellia habitat (*Howellia aquatilis*) study, which required visiting 101 ponds carrying bulky, temperamental equipment, to help document their hydrology.

Baseline botanical/ecological survey was completed for BLM lands in Carter County, and closer to home, for BLM lands in the Scratchgravel Hills of the Helena Valley. We are producing a circumscribed "roster" of the sensitive/watch species on BLM lands and their distribution, abundance, habitat, and status update. The roster includes a new species addition to the state flora (Dakota buckwheat; *Eriogonum visherii*) and other results which are still being determined pending taxonomic consultation.

Baseline botanical/ecological survey was also conducted at eight Research Natural Areas in the national wildlife refuge system, and in a Rapid Ecological Assessment; one segment of which was larger than Delaware. New information was picked up on watch species enigmas, in addition to the baseline assessment contributions,

### **Community Ecology:** *Research, Inventory, Monitoring of Plant Communities*

The Community Ecology program continued to work with the ECADS (ECODATA) project as beta-testers, and refinements continue to this important software.

Completed field projects include an ecological study of the Blackfeet Indian Reservation Alkali Lake area and aspen parkland; significant findings relating to the parkland included describing and pinning down the relative degree of rarity of several plant associations of moist to wet environments. These communities support abundant populations of several species (a number of which are grizzly bear foods) that occur nowhere else in such abundance; in addition these environments support high numbers of neotropical migrant birds and constitute a crucial portion of grizzly bear spring range. The Alkali Lake area supported diverse grassland types, several wetland types and sampling resulted in confirming with plot data several community types described in the literature, but for which we had only fragmentary evidence of their Montana existence; a rare plant occurrence was also documented.

The summer of 1997 found Bonnie Heidel (botanist) and Steve Cooper (ecologist) conducting rapid ecological assessments in the Northern Great Plains Steppe (NGPS) ecoregion, in an initial attempt to inventory and describe this immense region's biological resource. This is one of the first projects to implement assessment planning at a landscape level, working across a variety of geopolitical boundaries.

Field work was conducted by Cooper and Heidel on various U.S. Fish and Wildlife Refuge Research Natural Areas (RNAs, all within the NGPS) ; preliminary findings indicate that some of the targets these RNAs sought to capture were in fact not included and perhaps better candidates await identification on the landscape.

Intensive field work on plant communities and sensitive species was conducted in Carter County ( a portion of the NGPS) by Cooper, Heidel and Jim Vanderhorst. Several new additions to the state flora and an informed description and estimate of the rarity of the plant communities of this region will result.



The program also received an EPA Wetland Protection Grant, for the purpose of conducting a wetland inventory and assessment within a high-priority watershed. This grant will allow us to add a wetlands ecologist to our staff for one year. Given the extremely high interest in wetlands data among our users, this is a significant step towards adding wetlands information to our core data sets.







